

6.2 Saving and Investing





Goals for the Day

1

Saving Money
and Annuities

2

Examples

1

Saving Money and Annuities



What is future value (FV or A)?



■ Amount of money at some future time



$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$



FV



Think: Principal = Present Value PV

Know:

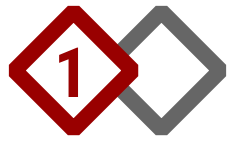
Initial investment (P)

Want to know:

How much will I have later
(FV, A)



What is present value?



- Amount of principal needed now in order to reach a future value amount

$$PV = \frac{A}{\left(1 + \frac{r}{n}\right)^{nt}}$$

Know:

How much will I have later (A)

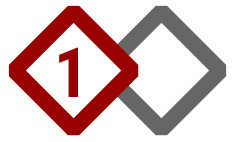
Want to know:

Initial investment (PV)





Present Value



Example

Lyric wants to have \$20,000 in 10 years. If she can get an 8% APR compounded semiannually, how much money does she need to invest right now to reach her goal?

$$PV = \frac{A}{\left(1 + \frac{r}{n}\right)^{nt}} = \frac{20,000}{\left(1 + \frac{0.08}{2}\right)^{2 \cdot 10}} \approx \$9,127.74$$



What is an annuity?



- Making regular, repeated payments into an account (or taken out of an account) over time
- Annuities earn compound interest

%

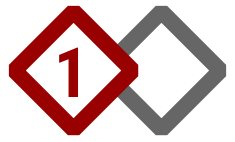
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Finding Future Value of an Annuity



$$FV = PMT \frac{\left[\left(1 + \frac{r}{n} \right)^{nt} - 1 \right]}{\left(\frac{r}{n} \right)}$$

Know:

Regular payment amount (PMT)

Want to know:

How much will I have later (FV)



Annuities – Finding Future Value



Example

Regina deposits \$200 every month into a savings account earning 5% APR.
How much money will be in her account after 15 years?

$$FV = PMT \frac{\left[\left(1 + \frac{r}{n} \right)^{nt} - 1 \right]}{\left(\frac{r}{n} \right)} = 200 * \frac{\left[\left(1 + \frac{0.05}{12} \right)^{12*15} - 1 \right]}{\left(\frac{0.05}{12} \right)} \approx \$53,457.79$$



Annuities – Finding Future Value



Example

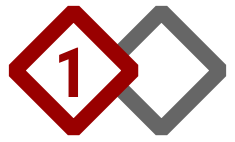
Continuing the previous example.

How much money will Regina contribute to her account over 15 years?

$$\begin{aligned} \text{Total Deposited} &= PMT * \# \text{ of payments} \rightarrow n * t \\ &= 200 * 12 * 15 = \$36,000 \end{aligned}$$



Finding Payments from an Annuity



$$PMT = FV \frac{\left(\frac{r}{n}\right)}{\left[\left(1 + \frac{r}{n}\right)^{nt} - 1\right]}$$

Know:

How much I will have later (FV)

Want to know:

Regular payment amount (PMT)





Annuities – Finding Payments



Example

Anna wants to have \$50,000 in 20 years. How much does she need to deposit each month into a savings account earning 7% APR?

$$PMT = FV \frac{\left(\frac{r}{n}\right)}{\left[\left(1 + \frac{r}{n}\right)^{nt} - 1\right]} = 50,000 * \frac{\left(\frac{0.07}{12}\right)}{\left[\left(1 + \frac{0.07}{12}\right)^{12*20} - 1\right]} \approx \$95.98$$

2

Examples

Example #1



Calculate the amount of money Audrey needs to invest right now (in one lump sum) in order to have \$100,000 after 18 years with an APR of 7% compounded monthly. Round your answer to the nearest cent, if necessary.

\$28,469.43



Example #2

Drake starts an IRA (Individual Retirement Account) at the age of 22 to save for retirement. He deposits \$400 each month. The IRA has an average annual interest rate of 7% compounded monthly. How much money will he have saved when he retires at the age of 65? Round your answer to the nearest cent, if necessary.

\$1,310,451.88



Example #3

Jacob deposits \$203.77 each month into an annuity account for his child's college fund in order to accumulate a future value of \$60,000 in 18 years. How much of the \$60,000 will Jacob deposit into the account in total, and how much will be interest he has earned? Round your answers to the nearest cent, if necessary.

Total invested = \$44,014.32
Interest earned = \$15,985.68



Example #4

Devon deposits a fixed amount monthly into an annuity account for his child's college fund. He wishes to accumulate \$65,000 in 17 years. Assuming an APR of 3.6% compounded monthly, how much of the \$65,000 will Devon deposit into the account in total, and how much will be interest he has earned? Round your answers to the nearest cent, if necessary.

$PMT = \$231.47$ (rounded to nearest cent)

Total invested = \$47,219.88

Interest earned = \$17,780.12